

Life expectancy in men who have never smoked and those who have smoked continuously: 15 year follow up of large cohort of middle aged British men

Andrew N Phillips, S Goya Wannamethee, Mary Walker, Andy Thomson, George Davey Smith

See p 929

Abstract

Objective—To estimate the life expectancy in a representative sample of men who have never smoked and of those who have smoked all their adult lives.

Design—15 year follow up of a large representative cohort of British men in the British regional heart study and use of national mortality statistics for 1992.

Subjects—7735 middle aged British men aged 40-59 at the time of screening (between 1978 and 1980).

Main outcome measures—Mortality from all causes and from smoking related causes.

Results—1624 men had never smoked at the time of screening and did not take up smoking during the study. 127 of them died during follow up. 3151 men began smoking before they were 30 and were still smoking at the time of screening. Of these, 751 had stopped smoking five years after screening; they were excluded from the analysis five years after the date they had stopped. 560 of the lifelong smokers died during follow up. When study estimates were combined with those from national mortality statistics for men aged 20-40, only an estimated 42% (95% confidence interval 36% to 50%) of lifelong smokers alive at the age of 20 would be alive at 73, compared with 78% (74% to 82%) of lifelong non-smokers.

Conclusion—These estimates present the effects of smoking on mortality in a way that is easily communicated to patients and the general public in health promotion initiatives.

Introduction

Many studies have assessed the increase in risk of death associated with cigarette smoking, and smoking is thought to have a direct causal role in diseases such as respiratory disease, coronary heart disease, stroke, and lung cancer. Only a few reports, however, have directly estimated the reduced survival prospects of smokers compared with non-smokers,¹⁻³ and none has done so for a representative sample of British men. We followed up a cohort of 7735 men who are representative of the middle aged British male population for up to 15 years as part of the British regional heart study to estimate directly the survival prospects in those who had smoked all their adult lives and in those who had never smoked. The association between cigarette smoking and death from all causes and between smoking and the risk of developing several specific diseases have previously been reported for this cohort.⁴⁻⁶

Subjects and methods

The 7735 men were aged between 40 and 59 in 1978-80 at the time of entry to the British regional heart study, which has been described in detail.⁴⁻⁷ The men were recruited from one representative general practice in each of 24 towns in England, Wales, and Scotland. At initial screening a questionnaire asking about lifelong smoking habits and a range of other subjects was administered by a nurse. Since then the men have been followed up to ascertain whether they have died by tag-

ging their names on the NHS central registers at Southport and Edinburgh and through their general practices.⁸ By 31 December 1993, the cut off date for this analysis, follow up was at least 99% complete.

The surviving men were also contacted by means of a postal questionnaire five and 12 years after screening to update their smoking status; response rates were 98% (7276/7396) and 91% (5934/6528), respectively. Follow up data on those who reported that they had stopped smoking in the questionnaire sent to them five years after screening were excluded from this analysis after they had stopped smoking for five years. Men who had smoked cigarettes but had given up before entering the British regional heart study were not included in either of the smoking groups because of the heterogeneous nature of their smoking histories and because we wanted to study the two extremes of lifelong smoking and not smoking.

We used standard life table techniques and first included men in the life table at the age at which they entered the study (referred to as left truncation by statisticians) to estimate the percentage of subjects alive at 20 who would survive to 73. From 20 to 40 this percentage was based solely on national mortality statistics for 1992⁹ as the British regional heart study has no data on mortality at these ages. From 40 onwards survival estimates based on all the men in the British regional heart study, regardless of smoking history, were compared with survival estimates based on national mortality statistics for 1992.⁹

To assess the extent to which survival differences were due to deaths from smoking related causes we considered the following causes of death to be potentially related to smoking: cardiovascular disease (codes 390-458 of the International Classification of Diseases, ninth revision (ICD-9)); respiratory disease (codes 460-519); malignant neoplasms of the lip (code 140), tongue (code 141), mouth and pharynx (codes 143-149), oesophagus (ICD code 150), and pancreas (code 157); respiratory system neoplasms (codes 160-163); urinary system neoplasms (codes 188-189); and malignant neoplasms of unspecified site or secondary neoplasms (codes 195-199).

Results

By 31 December 1993, 1278 of the 7735 men in the British regional heart study had died and 58 had emigrated. Figure 1 shows the survival curves after the age of 20 for men nationally and for the cohort in the study. The close correspondence between the two curves after the age of 40 shows that the men in the British regional heart study are representative of men in the general population.

At screening 5900 (76%) of the men had smoked cigarettes at some time. They had begun smoking at a median age of 16. Only 12.7% (749) started after the age of 20, and only 1.3% (77) after the age of 30. A total of 3151 men who began smoking before they were 30 were still smoking at the time of screening for the British regional heart study; 751 of them reported that they had stopped smoking in the questionnaire sent to them five years after screening. A total of 1624 (21%) of the men had never smoked cigarettes, a pipe, or cigars. By

Department of Primary Care and Population Sciences, Royal Free Hospital School of Medicine, London NW3 2PF

Andrew N Phillips, reader in epidemiology and biostatistics
S Goya Wannamethee, British Heart Foundation research fellow
Mary Walker, research administrator
Andy Thomson, computer programmer

Department of Social Medicine, University of Bristol, Bristol
George Davey Smith, professor of clinical epidemiology

Correspondence to: Dr Phillips.

BMJ 1996;313:907-8

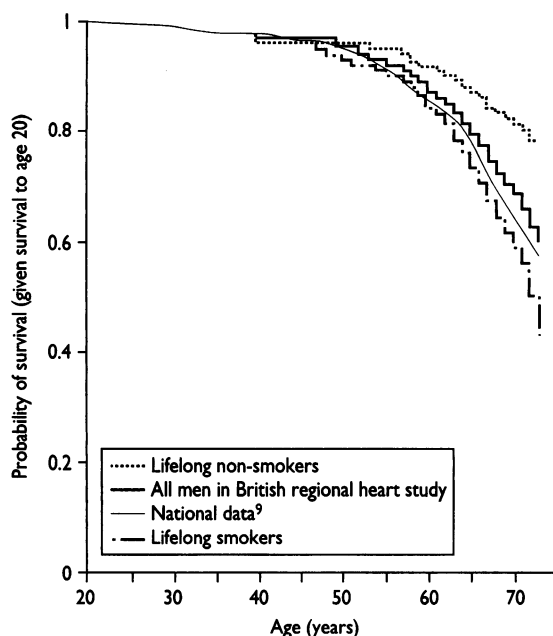


Fig 1—Probability of survival to given ages for lifelong smokers, lifelong non-smokers, and all men in British regional heart study and from national data

December 1993, 127 lifelong non-smokers and 560 lifelong smokers had died. Figure 1 shows the survival prospects of the 3151 lifelong smokers and the 1624 men who had never smoked. Of those alive at 20, an estimated 42% (95% confidence interval 36% to 50%) of lifelong smokers would be alive at 73 compared with 78% (74% to 82%) of lifelong non-smokers.

The association of some causes of death with cigarette smoking—for example, suicide¹⁰—is likely to be due to confounding and not a causal effect of smoking. We therefore repeated the life table analysis, sharing all deaths unrelated to smoking between the two groups, weighting them according to the numbers of lifelong smokers and non-smokers at the time. This enables the deaths unrelated to smoking to have an equal impact in the two groups. Thus we tried to mimic a situation in which deaths from smoking unrelated causes such as suicide occur at a similar rate in smokers and those who have never smoked. In this analysis 136 of the 687 deaths in the two groups were unrelated to smoking. The results gave similar estimates to those obtained in the main analysis (44% of lifelong smokers would survive to age 73 compared with 77% of lifelong non-smokers), suggesting that most of the difference in survival between the smoking groups is accounted for by deaths from causes known to be related to smoking.

Furthermore, we evaluated the association between smoking and mortality in a Cox proportional hazards model to assess the extent to which the association could be explained by known confounders. Age rather than time of entry to the study was the survival variable, and we allowed for late entry into the risk set (subjects

being at different ages at the time the study started) by fitting smoking as a time dependent covariate and treating men as having a missing value until the age when they were recruited to the study. The univariate relative hazard for lifelong smokers compared with lifelong non-smokers was 2.69 (2.23 to 3.25). After adjustment for calendar year, marital status, alcohol consumption, social class, area of residence, and body mass index the relative hazard was 2.41 (1.98 to 2.94).

Discussion

Our analyses suggest that most of the difference in life expectancy between lifelong smokers and those who have never smoked is due to smoking itself. However, further confounding—by factors not yet recognised or because of the imprecise measurement of known factors—will occur to some extent.^{10 11} The overestimation of the detrimental effects of smoking by confounding will be counterbalanced to some extent by the error in measuring smoking behaviour. This will lead to dilution of the associations with mortality and thus underestimation of differences in survival.

Overall, the men in the British regional heart study had age specific death rates similar to those in men nationally in 1992 (fig 1). The fact that death rates have increased slightly since the beginning of the study in 1978 indicates that the men who entered the study have experienced slightly lower death rates than others of the same age in the general population. This means that both our estimates of the probability of surviving to age 73 may marginally overestimate those that apply to men generally.

Our estimates are a useful guide to the likely mortality in men who take up smoking, and they show a strikingly favourable long term survival rate for those who never smoke. Doll *et al* reported the survival prospects of smoking and non-smoking British doctors.³ On the basis of follow up of some 35 000 British doctors, the probability of surviving to 70 in those alive at 35 was 80% for those who had never smoked and 59% for those who then smoked.³ Doctors, however, have a particularly low mortality: the standardised mortality ratio for doctors of working age around the 1981 census was 66.¹² Survival estimates for a representative sample of British men have not previously been available. The considerable survival advantage for non-smokers means that the effects of smoking on mortality may be easily communicated to patients by general practitioners and in health promotion initiatives.

We thank Professor Gerry Shaper for helpful suggestions.

Funding: The British regional heart study is a research group of the British Heart Foundation and is also supported by the Stroke Association.

Conflict of interest: None.

Key messages

- Smoking increases the risk of death from lung cancer, coronary heart disease, stroke, respiratory disease, and other diseases
- Estimates of life expectancy according to smoking habits have not previously been available for a representative sample of British men
- Men who never smoke have a 78% chance of reaching 73; those who start smoking by the age of 20 and never stop have a 42% chance
- These estimates are simple and understandable to patients and the general public
- Stopping smoking should lead to sizeable reductions in the risk of early death

- 1 Pearl R. Tobacco smoking and longevity. *Science* 1938;87:2253-4.
- 2 Rogers RG, Powell-Griner E. Life expectancies of cigarette smokers and nonsmokers in the United States. *Soc Sci Med* 1991;32:1151-9.
- 3 Doll R, Peto R, Wheatley K, Gray R, Sutherland I. Mortality in relation to smoking: 40 years' observations on male British doctors. *BMJ* 1994;309:901-11.
- 4 Cook DG, Pocock SJ, Shaper AG, Kussick SJ. Giving up smoking and the risk of heart attacks: a report from the British Regional Heart Study. *Lancet* 1986;iii:1376-80.
- 5 Cook DG, Kussick SJ, Shaper AG. The respiratory benefits of stopping smoking. *Journal of Smoking Related Diseases* 1990;1:45-58.
- 6 Tang JL, Cook DG, Shaper AG. Giving up smoking: how rapidly does the excess risk of ischaemic heart disease disappear? *Journal of Smoking Related Diseases* 1992;3:203-15.
- 7 Shaper AG, Pocock SJ, Walker M, Cohen NM, Wale CJ, Thomson AG. British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns. *BMJ* 1981;283:179-86.
- 8 Walker M, Shaper AG. Follow-up of subjects in prospective studies based in general practice. *J R Coll Gen Pract* 1984;34:365-70.
- 9 Office of Population Censuses and Surveys. *Mortality statistics*. London: HMSO, 1992. (Series DH1.)
- 10 Davey Smith G, Phillips AN, Neaton JD. Smoking as an "independent" risk factor for suicide: illustration of an artefact from observational epidemiology? *Lancet* 1992;340:709-12.
- 11 Davey Smith G, Shipley MJ. Confounding of occupation and smoking: its magnitude and consequences. *Soc Sci Med* 1991;32:1297-300.
- 12 Office of Population Censuses and Surveys. *Registrar General's decennial supplement on occupational mortality, 1979-1983*. London: HMSO, 1986.

(Accepted 29 July 1996)